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by J. Niederleitner and P. Bihuniak

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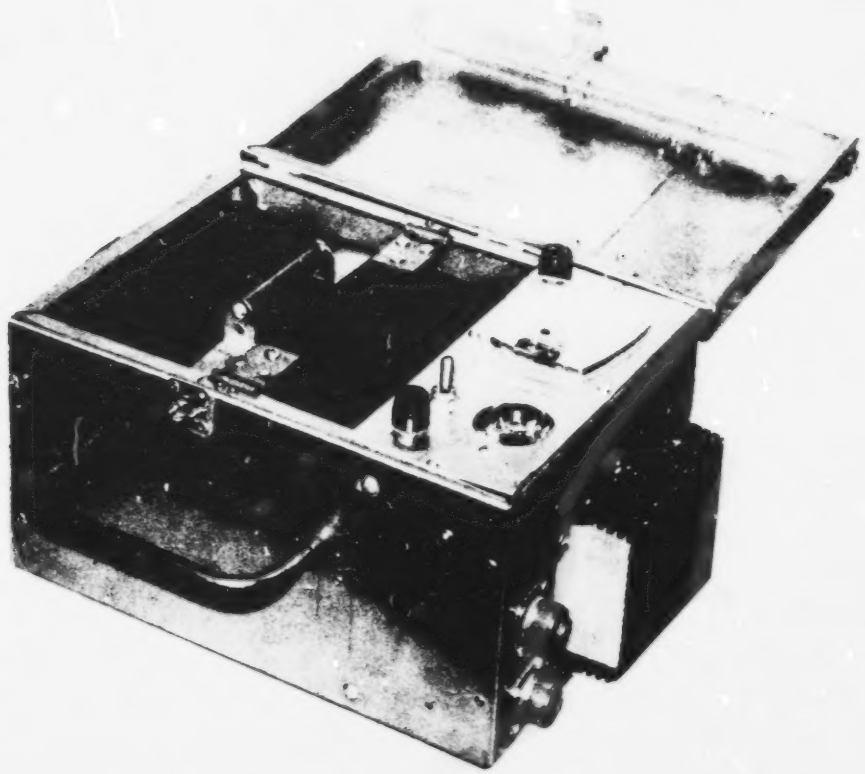

northern forest research centre
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A HEAVY-DUTY 12-VOLT DC POWER PACK TO OPERATE AIRBORNE REMOTE SENSING SYSTEMS

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ABSTRACT

A portable heavy-duty rechargeable power pack designed and built by the Northern Forest Research Centre solved power supply problems encountered with airborne remote sensing systems. Aircraft-generated electrical interference with the remote sensing system was eliminated, and the operating span of the system was increased from 2 h to more than 8 h without recharging. The power supply pack consists of a 20 A·h 12-V DC Globe gel/cell battery encased in a steel box fitted with a 12/24-V DC and a 117-V AC charger.

RÉSUMÉ

Le Centre de recherche forestière du Nord mit au point une source d'énergie portative et rechargeable, à grand rendement, qui résoud les problèmes relatifs aux systèmes par avion de détection à distance. Cet appareil permet d'éliminer l'interférence électrique produite par l'avion et le système peut être en opération, sans être rechargé, durant plus de 8 h plutôt que 2 h. Cette nouvelle source d'énergie est faite d'une batterie "Globe gel/cell" de 20 A.h, 12 volts, courant direct, emballée dans une boîte d'acier avec un chargeur de 12/24 volts à courant direct et de 117 volts à courant alternatif.

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THE PROBLEM

More and more airborne remote sensing instruments are appearing on the market. Most of them come with factory-supplied power packs or are meant to be hooked into the aircraft's electrical system. However, field use of these units has shown that neither the original battery power pack nor the aircraft's current may be satisfactory.

In 1974 and 1975 three remote sensing systems were subjected to aerial testing: a Sony Vidicon, an AGA Thermovision 750, and a Barnes Airborne Fire Spotter. The first two instruments would operate for barely 2 h on the factory-supplied batteries. The Barnes Fire Spotter, which was supposed to operate on the aircraft's electrical system, would false-alarm every time the pilot flicked a switch or a spark occurred somewhere in the power circuit. Further problems arose from having to tap a different power system each time the patrol aircraft was changed. Manufacturer's prices for the power supply units ranged from $170 to $600.

A more powerful and cheaper power source to operate airborne remote sensing instruments was needed.

THE SOLUTION

A simple, inexpensive power pack designed at the Northern Forest Research Centre eliminated the power supply problems. The unit has now functioned flawlessly for two seasons. Kept on charge during idle periods, the power supply was never exhausted, even on heavy operating days. The operating span of the remote sensing systems was extended to over 8 h without recharging.

The heart of the power pack is a spillproof, vented, 20 A·h Globe gel/cell[1] battery, wired to a 117-V AC and a 12/24-V DC charger (Figure 1). The whole package, properly fused and fitted with the necessary cable connectors, is encased in a 0.9-mm (20-gauge) stainless steel metal box with an external carrying handle. A built-in ammeter tells the operator about the batteries' state of charge, a feature badly missed on the factory-supplied power packs. The power pack can be charged from a standard 117-V AC source, a car's cigarette lighter, or the aircraft's electrical system. Although the power supply unit is equipped with a handle and is fully portable it is not recommended for carrying by hand for any length of time, mainly because of the heavy weight (14.5 kg). In flight the power pack is placed in a convenient place such as under the aircraft's seat and held in position with nylon belting.

Total cost of the prototype power pack in 1974 was $120, not including 8 h of labor.

DESCRIPTION OF THE POWER PACK AND ITS COMPONENTS

CASE

The sturdy case protects the pack's components and minimizes the effects of a battery rupture (Figure 1).

Dimensions of the sheet metal case:

20 cm (8 in.) x 20 cm (8 in.) x 33 cm (13 in.)

Material needed for case:

0.5 m^2 (5½ ft^2) of 0.9-mm (20 gauge) stainless steel sheet metal, rivets, 4 hinges, 3 hasps.

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[1] Registered Trademark of Globe-Union Inc.
5757 North Green Bay Ave., Milwaukee, Wisconsin 53201

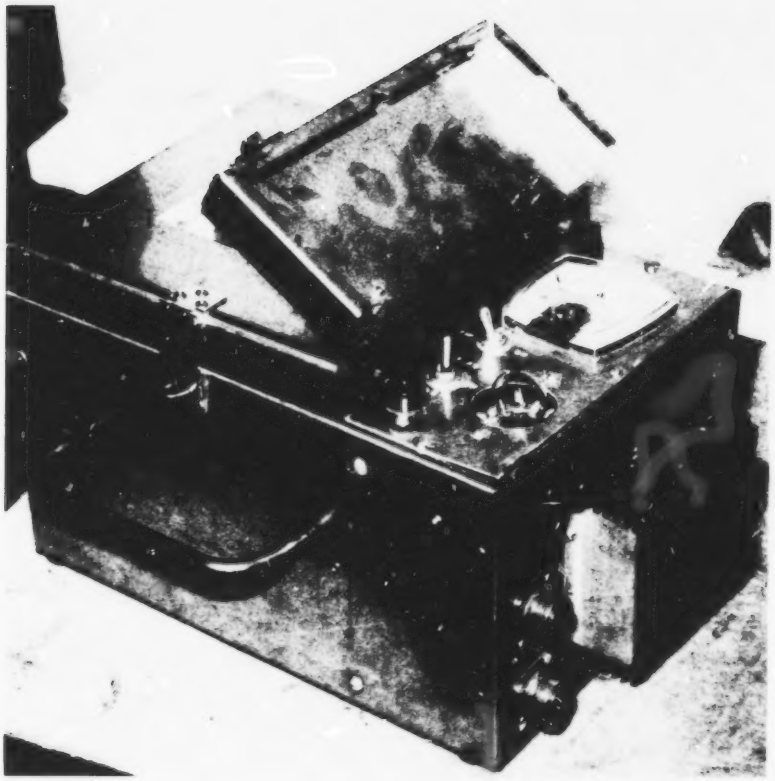

Figure 1. Stainless steel sheet metal case showing ammeter and charger selector switches.

BATTERY

Trade name and model: Globe[2] gel/cel, Model GC12200

Capacity: 20 A·h

Dimensions: L. 17.6 cm (6.92 in.)

W. 16.6 cm (6.56 in.)

H. 12.6 cm (4.95 in.)

Weight: 7.6 kg (16.7 lb)

Terminals: GC quick disconnect terminals to match with AMP. INC. FASTON "250" series receptacles or equivalent.

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[2] The reference to trade names does not constitute an endorsement or recommendation of a particular product. Any similar product meeting the performance standards can be substituted.

CHARGERS

(See Figures 2-4, Wiring components and diagram)

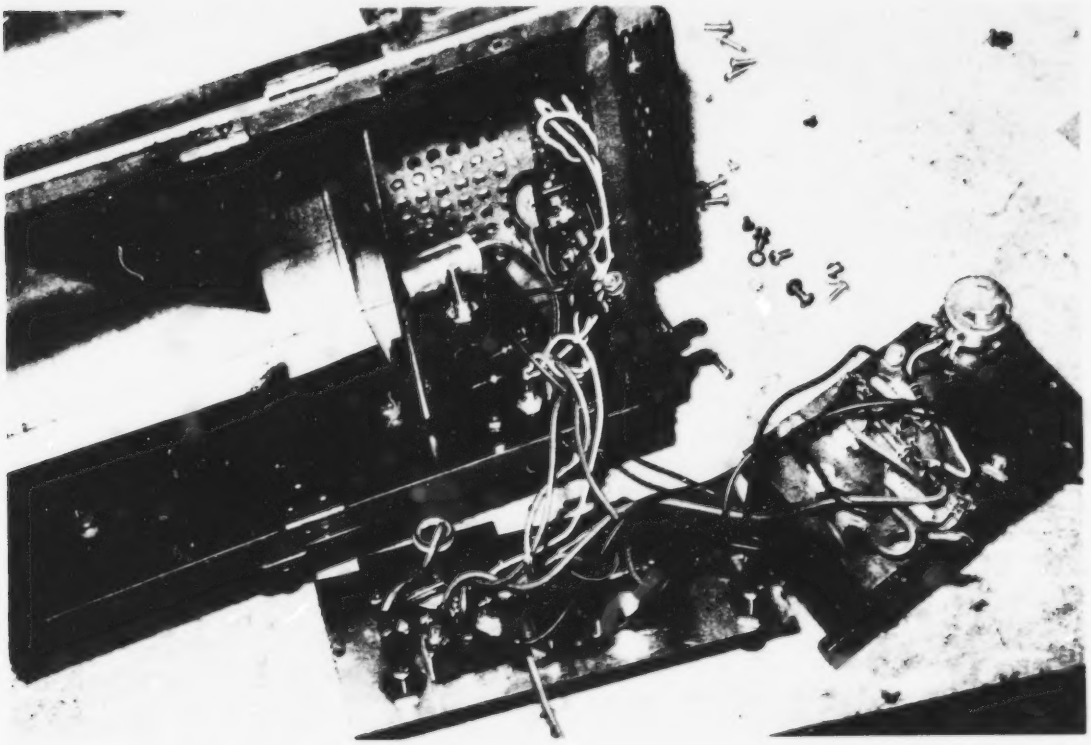
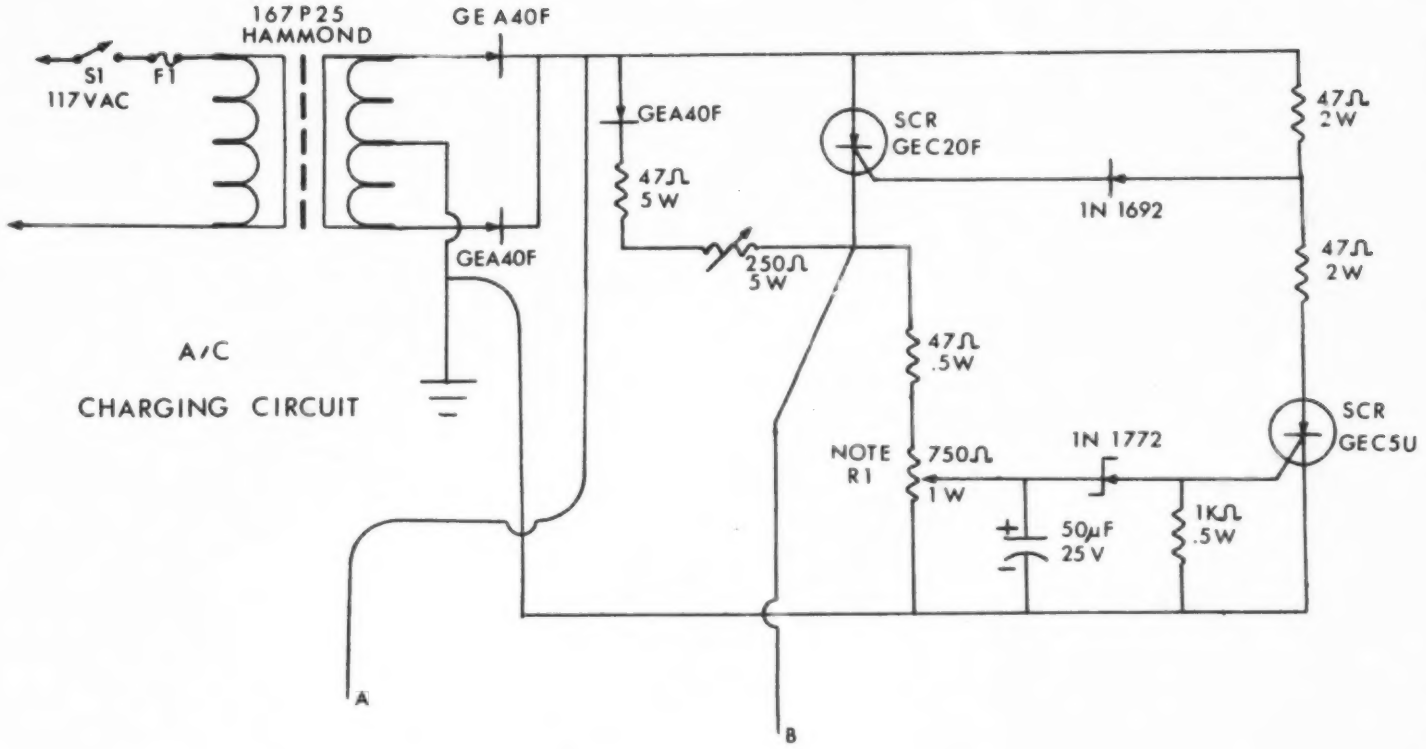


Figure 2. Charger wiring and components.

Material needed for chargers:

Part Name	Quantity	Description
Transformer	1	167P25 Hammond iron core
Switch	1	SPST 120-V 6 A
Switch	2	DPDT Center off 120-V 10 A
Diode	3	GE A40F
Diode	1	IN-1692
Diode	1	IN-3492
Diode	1	IN-91
Zener Diode	1	IN-1772
Zener Diode	1	IN-200

Part Name	Quantity	Description
Resistor	1	47 Ω 5 W
Resistor	1	47 Ω ½ W
Resistor	2	47 Ω 2 W
Resistor	1	1 K Ω ½ W
Resistor	3	200 Ω ½ W
Resistor	1	270 Ω ½ W
Variable resistor	1	250 Ω 5 W
Variable resistor	1	750 Ω 1 W
Variable resistor	1	50 Ω ½ W
Silicon controlled rectifier	1	SCR GE C20F
Silicon controlled rectifier	1	SCR GE C5U
Lamp	1	#1073
Fuse	2	Buss AGX-3A 125 V
Capacitor	1	50 μF 25 V
Capacitor	1	2000 μF 50 V
Transistor	1	2N 392
Transistor	1	2N 3215
Transistor	1	2N 1149
Plug	1	MS3102A-145-7P Amphenol 3 pin male
Plug	1	MS3102A-145-7S Amphenol 3 pin female
Heatsink	1	Wakefield 600 series Heatsink
Ammeter	1	Armaco UM2 10 A DC



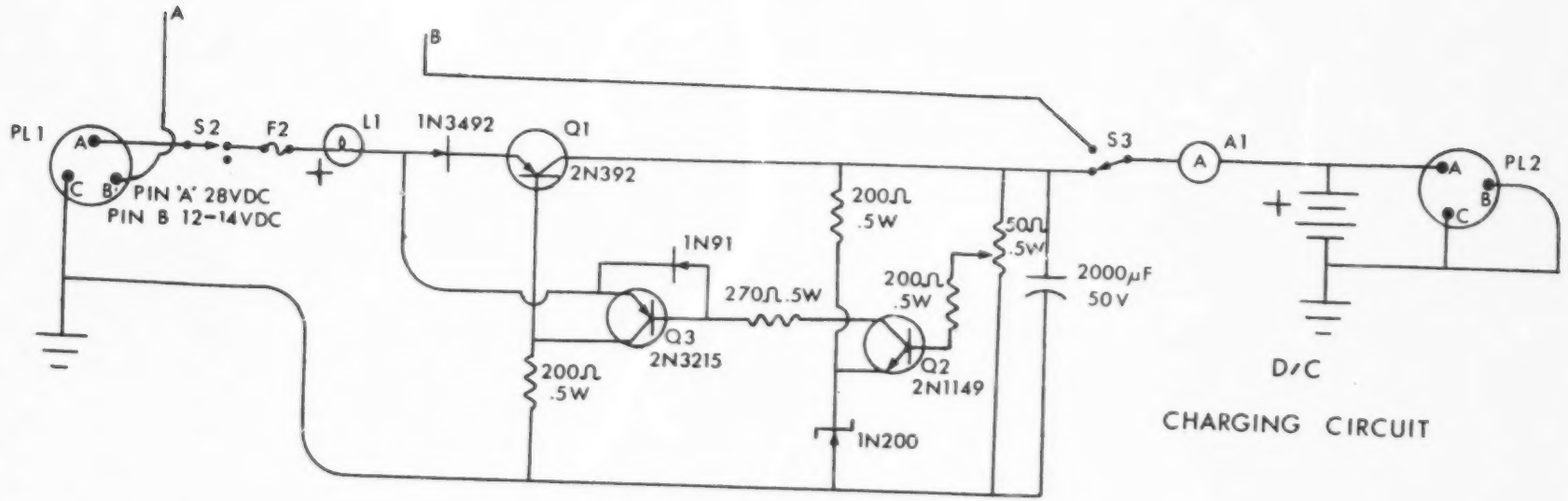
NOTE R1 ADJUSTMENT

CONNECT FULLY CHARGED BATTERY TO CHARGER. ADJUST R1 TO SET CHARGE CUTOFF.

GLOBE GEL/CELL CHARGER

- OPERATE FROM 117VAC
  28V DC
  12-14 V DC

Figure 3. Wiring diagram, Part 1.



F1 - BUSS AGX -- 3 A 125 V
F2 - BUSS AGX - 3 A 125 V
S1 - SPST 120 V 6 A
S2, S3 - DPDT CENTER OFF 10 A 120 V
A1 - ARMACO UM2 10 A DC
PL1 - MS3102A - 14S - 7PAMPHENOL 3 PIN MALE
PL2 - MS3102A - 14S - 7S " 3 PIN FEMALE
L1 #1073 LAMP

NOTE TRANSISTOR Q1, Q2 HEATSINK MOUNTED. USE WAKEFIELD 600 SERIES HEATSINK OR EQUIVALENT.

Figure 4. Wiring diagram, Part 2.